Secret. E.-27—100,000—47-5-47.

DEVELOPMENT (19[illegible]) Department

SERIES.

G.O. No. 4808

Dated 30th August 1947.

[Despatch Abstract.]

AGRICULTURE - Indian Council of Agricultural Research - Scheme for the multiplication and distribution of hybrid cumbu seed - Forwarded.

GOVERNMENT OF MADRAS.
DEVELOPMENT DEPARTMENT.

Lr.Ms.No.4208.

From

The Secretary to Government.

To

The Secretary to the Indian Council of Agricultural Research, New Delhi.

Dated, Fort St. George, the 28th August 1947.

Sir,

Sub: Agriculture - Indian Council of Agricultura Research - Scheme for the multiplication an distribution of Hybrid cumbu seeds - Forwarded.

I am directed to invite your attention to the correspondence ending with the Council's letter No.F.45(28)/45-A, dated 20-4-46, and to forward herewith a Scheme for the multiplication and disbribution of hybrid cumbu seed submitted by the Director of Agriculture, Madras.

The scheme is proposed to be worked out for a period of 2 years from 1949-50 and is estimated to cost Rs.6,99,030/-. It is proposed to share the expenditure between the Indian Council of Agricultural Research and the Provincial Government Government on a 50:50 basis.

The scheme is estimated to yield a receipt of Rs.3,25,300/- during 1950-51 by the sale of the seed produced in the first year of its working and it is proposed to credit to the I.C.A.R. with the entire amount. The receipts realised by the sale of seed produced in the second year of the scheme viz. 1950-51 which is also estimated at Rs.3,25,300 will be credited to the Provincial Government.

I am to request that the approval of the I.C.A.R. to the scheme may be obtained and communicated to the Government.

Yours faithfully,

Sd/- x x
Secretary to Government.

Copy to the Director of Agriculture.
(He is requested to submit necessary printed copies copies of the scheme at an early date for transmission to the I.C.A.R).

GOVERNMENT OF MADRAS.
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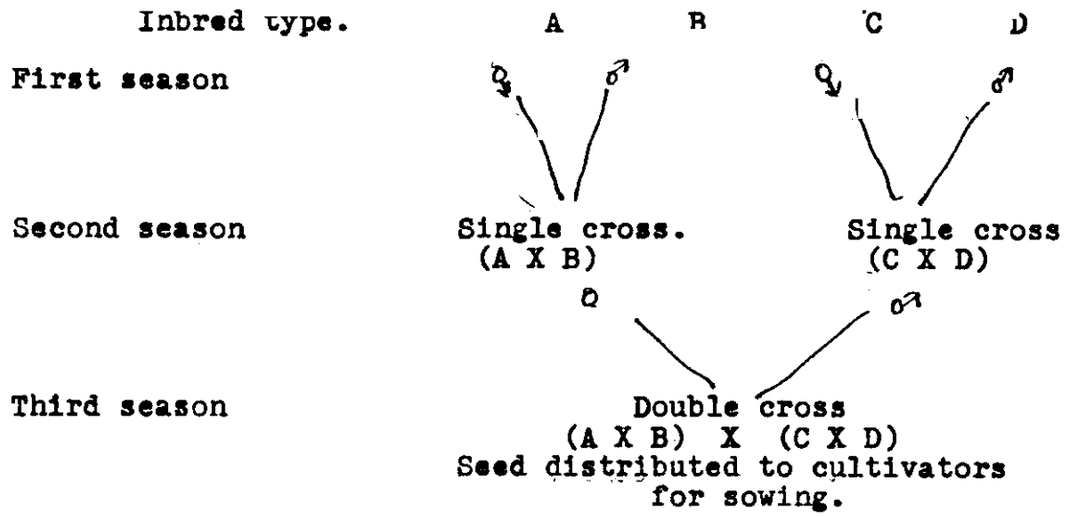
INDIAN COUNCIL OF AGRICULTURAL RESEARCH.

SCHEME FOR THE PRODUCTION, MULTIPLICATION AND DISTRIBUTION OF HYBRID CUMBU.

Introduction.-- In the improvement of normally cross-polinated crops like maize and sugar beet, the usual methods of breeding by pure-line selection were not found to be very successful. In maize, the male and female inflorescences are borne on separate parts of the plant. The improvement of maize by breeding by the method of pure-line selection or "ear to row" method, as it is termed in the United States was in vogue there since 1897. But the results were disappointing. It was observed that the slight improvement that was obtained by selection was not cumulative and could not be maintained. On the contrary, this method of selecting pure types by inbreeding was always followed by a reduction in plant vigour and yield. To obviate this disadvantage, the later development in corn breeding mfx technique was the production of "hybrid corn" resulting from the crossing of selected inbred lines. This offered greater promise than any of the methods previously tried. Superiority not only in productiveness, but also, in resistance to wind, disease and other unfavourable conditions was observed. This method of breeding has been in progress in the United States since 1932 and the growing of hybrid corn has become a general practice. With hybrid maize, increases up to 35 per cent over the ordinary open pollinated seed are reported. The present technique of producing hybrid maize seed is outlined below:-



The peculiar characteristic of "hybrid corn" seed which restricts its potentialities to the first generation only makes it necessary to produce fresh hybrid seed every year. This needs an organization to maintain a continuous supply of hybrid seed at the various centres.

Object. - Among the millets, cumbu (Bajra--Penniselum typhoides Stapf and Hubbard) is similar to maize in being normally cross-fertilised. Cumbu is protogynous. In this crop plant, though the seed bearing spikelets are bisexual the stigmas develop first and the anthers emerge out from the spikelets and dehisce two to three days later, by which time

the former lose their receptivity. Consequently pollination is normally affected from the earhead of a neighbouring plant which has flowered earlier. It is a common observation that a few first-developed earheads have either no grains set or have grains set only in the lower half. The crop being thus normally "cross-fertilized" it was considered desirable to investigate the possibilities of improving yield by obtaining hybrid seed of known parentage, as is being done in maize in the United States.

Importance.- The normal area of cumbu grown in the Madras Province is about 2,638,000 acres and the normal total production of grain 685,500 tons. The main regions of the Province where this millet is an important crop may be grouped as follows:-

	Acres.	Percentage of total area in the Province.
Coimbatore, Salem and Trichinopoly	898,500	34
Vizagapatam, East and West Godavari, Kistna, Guntur and Nellore.	551,700	21
Cuddapah, Kurnool, Bellar, and Anantapur.	446,940	17
Madura, Ramnad and Tinnevelly.	371,660	14
Chittoor, North Arcot, Chingleput and South Arcot.	362,200	14

The largest area is in the Coimbatore district, 326,400 acres; Salem, 313,100 acres and Trichinopoly, 255,000 acres follow next in order. In the north of the Province, the normal area of the crop in the Vizagapatam district is 191,070 acres and in the Guntur district 176,490 acres.

As a foodgrain, cumbu is considered in many districts to be superior to sorghum (jowar). It is also shorter in duration, maturing in three to three and a half months, and is not so rigidly season bound as sorghum. Because of this, it is possible to grow the same variety in two seasons in a year, in dry lands during the monsoon period, and again in summer with irrigation. As already mentioned above, the cumbu plant being protogynous and normally cross fertilized it has been found difficult to evolve improved strains, by the ordinary methods of selection and to maintain the purity of the strains. Hence it is considered desirable to test the possibilities of taking advantage of hybrid vigour as has been done successfully in the maize crop in the United States.

RESULTS OF PRELIMINARY STUDIES.-- Two of the improved strains, cumbu Co.1 (P.T.700) and cumbu Co.2 (P.T.367) and eigh other selections from X-rayed seed of P.T.700 were selected as parents and fifteen crosses were made in 1943. The hybrids were grown in 1944 summer season and compared with the parents. It was observed that in three crosses, the hybrids yielded more grain than both the parents, the increase ranging from 17 to 163 per cent, and in five others the hybrids yielded more grain

Season and grown in the following main season, eleven of these yielded more

than only one of the parents. Thirty-eight crosses were made in 1944 main season (September-December) and the hybrids were raised in 1945 summer. Though 23 hybrids yielded more grain than both the parents, the differences were significant only in three. Eleven hybrids were significantly superior to one of the parents. Forty-eight crosses were made in this grain than both the parents.

PROPOSED WORK:-- There is sufficient indication in the above experience that there is a possibility of obtaining increased yields by sowing hybrid seed. In the above trials the parents were chosen from the selections under yield tests in which selfed seed was available. It is considered desirable to have a wide collection of different varieties and types from the different parts of the Province as well as from other Provinces and States obtain sufficient inbred seed from those with desirable characters, make crosses between pairs of types and then test their yields. In choosing types, due regard has to be given to local preferences and peculiarities with reference to grain size, duration of crop, etc. For instance, in the southern districts of the Province, Madura, Ramnad, and Tinnevelly there is a preference for a grain of smaller size. Hence the parents chosen for producing hybrid seed for this region should conform to the local requirements.

Thus the main lines of work consist of the following:-

1. Collection and study of varieties.
2. Hybridisation and study of the hybrids.
3. Trial of the hybrids at the experiment stations and in the ryots' lands.
4. Production of hybrid seed in bulk and distributing the same to cultivators.

DURATION OF THE SCHEME:- For the collection of different varieties, isolating types, studying their characters, obtaining selfed inbred lines for crossing selected types and testing the hybrids, a period of three years is considered necessary. This comprises Part I of the scheme. This part of the scheme has been sanctioned by the Government of Madras, for a period of three years, and the scheme was commenced in March 1946. From among the large number of samples of cumbu seed(193) collected from different districts in the Madras Presidency and also from other Provinces and tested in 1946-47, eight promising samples have been selected to serve as suitable parents and crossed among themselves and their hybrid vigour and yield are under study. The best of these and the parents selected from preliminary studies will be multiplied and crossed to produce bulk hybrid seed for distribution. Production of the hybrid seed on a bulk scale and distributing it to the cultivators for sowing in their lands forms Part II of the scheme. The production of the bulk hybrid seed of the selected crosses will be done in the first year of this part of the scheme and the seed thus obtained will be stocked and distributed in the second year. Thus the period of the Part II of the scheme is two years, 1949-50 and 1950-51.

It is proposed that about 5,000 acres are to be sown with the selected parent types to obtain bulk hybrid seed in 1949-50. The produce from this area is expected to be about 25,00,000 lbs of seed, at a modest estimate of 500 lb. of grain yield per acre. This quantity of seed will be sufficient to sow on an area of about five lakhs of acres. The details of work involved in the two Parts of the scheme tabular form in Appendix I.

Location of work.-- The production of hybrid seed on a bulk scale for distribution to the cultivators is proposed to be organized at three centres, to start with. They are,

Centre of seed production.	Districts in which seed will be distributed.
Guntur	Vizagapatam and Guntur
Coimbatore	Coimbatore, Salem and Trichinopoly.
Tinnevelly	Madura, Ramnad and Tinnevelly.

Staff.--The following staff have been sanctioned for the Part I of the scheme:

	First year.	Second year.	Third year.
Assistant Millet Specialist (Rs.200-30/2-260-40/2-500)			
Upper Subordinate--Assistant (Rs.75-7½/2-105-E.B.-120-15/2-150-E.B.-170-15/2-200)			
Fieldmen (Rs.30-3/2-48)			
Peons (Rs.12-17) ...			

Due to the specialized nature of the work, it is proposed that for the Part II of the scheme also, the same staff employed during the third year of the Part I of the scheme is continued with the addition of three store-keepers to be in charge of the seed stores. In view of the large quantity of seed to be stored, it is considered necessary to have the store-keepers. The staff for the Part II of the scheme will consist of an Assistant Millet Specialist, four assistants, six fieldmen, three store-keepers and a peon.

Equipment.-- The bulk production of hybrid seed is proposed to be done under seed farm conditions in cultivators' lands. The seed produced in the lands will be purchased at the current market rates paying a premium of Re.0-8-0 per 100 lb. of seed. The seed will be dried well and stored in gunny bags in rented godowns. Provision has been made in the budget for the purchase of gunny bags, to rent godows for storing the bags, and for the periodical drying and re-bagging the seed to keep it free from insect damage. As the seed is small , double gunny bags will have to be used to prevent wastage. Provision is also made for the transport of seed from the godowns to the agricultural depots of the Agricultural Demonstrators for distribution. The distribution is proposed to be done through the Agricultural Demonstrators of the Taluks.

Finance.-- The details of expenditure and receipts for the two years for the Part II of the scheme are appended (Appendix II) As the staff employed for the Part I of the scheme are continued for the Part II of the scheme also, their pay is given with the appropriate increments which would have accrued during the tenure of office in the Part I of the scheme from its commencement. The gross expenditure for the two years is estimated to be Rs.6,99,000. The receipts during the period is expected to be Rs.3,25,300. Hence the net expenditure will be Rs.3,73,700. But, against this expenditure there will be a stock of 2,525,000 lb. of seed in stock, the value of which will be realized only in the succeeding year. The amount which will be realized by selling the seed and gunny bags in which it is stored, will amount to Rs.3,25,300. If this amount is deducted, the net expenditure will be only Rs.48,400. It is proposed that the total expenditure Rs.6,99,000 is shared half and half by the Indian Council of Agricultural Research and the Madras Government i.e. each should sanction an expenditure of Rs.3,49,500 for a period of two years 1949-50, and 1950-51. The

receipts (Rs.3,25,300 expected to be realized during the second year of the scheme will be credited to the Indian Council of Agricultural Research. The value of the seed in stock at the end of the second year of the scheme which is also estimated as Rs.3,25,300 and which will be realised only in the subsequent year will be credit as receipts of the Madras Government. Thus the actual net expenditure of each of the Indian Council of Agricultural Research and the Madras Government will be only Rs.24,200 for a period of two years. But for the purposes of accounting an expenditure of Rs.6,99,000 (Rs.3,43,824 in the first year and Rs.3,55,206 in the second year) has to be sanctioned on a 50:50 basis by the Indian Council of Agricultural Research and the Madras Government.

Coimbatore,
14th July 1947.

C.VIJAYARAGHAVAN,
Millet Specialist.

APPENDIX I.

HYBRID CUMBU SEED PRODUCTION AND MULTIPLICATION.

Part I - Production of hybrid cumbu seed.				Part II - Multiplication and disbribution of hybrid cumbu seed.			
First year, 1946-47.		Second year, 1947-48.		Third year, 1948-49.		Fourth year, 1949-50.	Fifth year, 1950-51.
Summer.	Main.	Summer	Main. A	Summer B	Main. C	D	E
Inbred parent seed (a) and (b).	Work at Research station to choose parents (a) and (b)		250 plants are bagged in each parent to obtain 15 lb. of selfed seed. (Second year, main season).	5 lb. of (a) and (b) are to be sown separately in 1 acre 500 lb. of pure seed of (a) and (b) are obtained 250 lb. of each parent.	125 lb. of each parent are to be sown in 25 acres to give 12,500 lb.of parent seed of (a) and (b).	Parent seed to be produced as in (C)	Continue as in (D)
Parent seed for crossing.				A-1 5 lb.of each parent obtained from (A)are to be sown in 2 acres in alternate rows to facilitate crossing and give 1000 lb. of hybrid seed(a) and (b)	B-1 250 lb.of the two parents are sown in 50 acres in alternate rows to produce 25,000 lb. of hybrid seed.	C-1 25,000 lb. of parent seed to be sown in 5000 acres to produce hybrid seed (2,500,000 lb).	D-1 Continue as in C-1.
Hybrid seed for high yield.					A-2. The hybrid seed (1000 lb)from (A-1) can be sown in 200 acres to	B-2. 25,000 lb. of hybrid seed can be sown	C-2 2,500,000 lb. of hybrid seed from 5,000 acres will

demonstrate potentialities of Heterosis.	~~25,000~~ in 5,000 acres in the 4th-year for high yield. (The seed from this area is not to be sown again)	cover an area of 5 lakhs of acres, i.e., 27 per cent of the total area of the 3 major tracts for which the scheme is outlined.

APPENDIX II.

Financial statement for a scheme of multiplication and distribution of hybrid cumbu seed--

(Part II of the original scheme)

Particulars.	1949-50. First year.	1950-51. Second year.	Total
EXPENDITURE.	Rs.	Rs.	
Pay of establishment (Officers)-- Assistant Millet Specialist (Rs.230-30/2-260-40/2-500).	3,120	3,120	624(
Pay of establishment-- 4 Assistants (Rs.100-5-140-10-220)-- ~~2xxxx~~ 2 starting at Rs.120 and 2 starting at Rs.100.	5,760	6,000	117(
6 Fieldmen at Rs.45-2-55-1-60	3,528	3,672	72(
3 Store Keepers at Rs.25-3-40.	900	1,008	19(
1 Peon (Rs.16-~~½~~-25).	104	210	414
Total Establishment	13,512	14,010	27522
Allowances--			
Cost of living and dearness allowances. Assistant Millet Specialist	600	600	1200
4 Assistants	1,008	1,056	2064
6 Fieldmen	1,296	1,296	2592
3 Store-keepers	576	576	1152
1 Peon	192	192	384
Total Allowances.	3,672	3,720	7392
Total, Pay and Allowances	17,184	17,730	34914
Travelling Allowances	750	750	1500
Capital Outlay--Non-recurring-- Purchase of 25,800 gunny bags, each at As.12	19,350	19,350	38700
Contingencies--Recurring-- Apparatus and Materials--Selfing bags, gunny, stiching thread, needles, etc.	750	750	1500
Postage and stationery	200	200	400
Working expenses--Recurring--			
~~Extrxx~~ Extra labour charges for sowing 5,000 acres of the parent types in alternate rows at Rs.5 per acre.	25,000	25,000	50000
Compensation to cultivators to remove rogues in 50 acres of the parent types at Rs.2 per acre.	100	100	200

Cost of 25,500 lb. of seed of the parent types (including 2 per cent extra for dryage and wasting during storage) at 10 lb. per rupee.	2,550	2,550	5,100
Cost of 25,50,000 lbs. of hybrid seed (with 2 per cent extra) at 10 lb. per rupee.	2,55,000	2,55,000	510,000
Premium for the 2,575,500 lb. of seed at As.8 per 100 lb.	12,878	12,878	25,756
Rents for godowns for storing the seed (12,900 bags) at Re.1 per 100 bags per month--Three months in the first year and whole of second year.	387	1,548	1,935
Bagging and transport charges to godowns at Rs.4 per bag	3,225	3,225	6,450
For drying and rebagging the seed once in 2 months at As.4 per bag each time	6,450	12,900	19,350
Transport charges for distributing the seed at As.4 per bag.		3,225	3,225
Total	3,05,590	3,16,426	6,22,016
Total expenditure	3,43,824	3,55,206	6,99,030

	Rs.
By sale of seed at 8 lb. per rupee - 25,000 lb. of parent types and 2,500,000 lb of hybrid seed.	3,15,625
By sale of 25,800 used gunny bags at As.6 each.	9,675
Total Receipts.	3,25,300
Total, Expenditure for two years.	6,99,030
Total, Receipts.	3,25,300
Net Expenditure for two years.	3,73,730

GOVERNMENT OF MADRAS.
DEVELOPMENT DEPARTMENT.

Lr.No.113338 A 11/47-1.

From

The Secretary to Government.

To

The Secretary to the Indian Council of
Agricultural Research, NEW DELHI.

Dated, Fort St. George, the 25th November 1947.

Sir,

Sub: Agriculture - Indian Council of Agricultural Research - Scheme for the production, multiplication and distribution of hybrid cumbu seed - Printed copies - Erratum -

Ref: Your letter No.F.45(16)-47-A, dated 9-10-1947.
This Government's letter No.98555 A 11/47-2, dated 31-10-1947.

I am directed to request that the following corrections may kindly be caused to be xxxxxx carried out in the printed copies of the scheme forwarded with this Government's letter cited

Page.	Para.	Line.	Incorrect.	Correct.
1	1	2	Selections	Selection
1	1	Last portion.	(Omission)	Third season (below second season).
2	2	2-	2,59,000 acres.	2,55,000 acres.

Your obedient servant,
xxxxxxxxx

Sd/-
Secretary to Government.

Copy to xxxxx the Director of Agriculture.

Indian Council of Agricultural Research,
Keeling Road, New Delhi.

No.F.45(16)/47-A., the 14th February, 1948.

From

Shree Sudhir Chandra Sarkar,
Under Secretary.

To

The Director of Agriculture,
M a d r a s.

Subject:- Scheme for production, multiplication and distribution of Hybrid Cumbu.

Sir,

With reference to your letter No.D.1/586/47, dated the 15th January, 1948, I am directed to enclose a copy of note recorded by Dr. Pal on the subject mentioned above and to say that in the circumstances stated the question of sanctioning the scheme will be considered next year on receipt of the requisite data referred to therein.

I have the honour to be,
Sir,
Your most obedient servant,

Sd/- S.C.Barkar.
UNDER SECRETARY.

No.F.45(16)/47-A.

Copy forwarded to the Secretary to the Government of Madras, Development Department, Madras, with reference to his letter M.S.No.4208, dated the 28th August, 1947. Relevant extracts from the proceedings of the meetings of the Scientific Committees of the Council are enclosed for information.

By order,

Sd/- x x
for Under Secretary.

(True Copies) V. Jayaraman
Office Assistant
Madras Record Office